AMENDMENTS TO THE SPECIFICATION

AT PAGE 1:

IN LINE 13 BEGINNING WITH THE WORD " Semiconductors ..." AND ENDING WITH THE WORDS "...can conduct current" PLEASE AMEND THE SPECIFICATION WITH THE REPLACEMENT PARAGRAPH AS FOLLOWS:

Semiconductor[[s]] materials exhibit a band gap between their valence and conduction bands of typically a few eV. Because this energy gap is so low, as the temperature of the crystal is increased, electrons are thermally excited and easily move from the ~~valance~~ valence band to the conduction band. The electrical properties of these materials, therefore, are ~~effected~~ affected not only by the movement of electrons into the conduction band but also by the formation of vacant sites or "holes" in the valence bands left behind by the departing electrons. Both can conduct current.

IN LINE 21 BEGINNING WITH THE WORD " Holes ..." AND ENDING WITH THE WORDS "...such as gamma or x rays" PLEASE AMEND THE SPECIFICATION WITH THE REPLACEMENT PARAGRAPH AS FOLLOWS:

Holes also may be created by the interaction of energetic radiation, such as X-rays, gamma rays, and the like, with intrinsic semiconductors and[[,]] therefore[[,]] one should be able to use these materials as detectors for measuring high-energy radiation. In fact, high-resistivity semiconductor radiation detectors are widely used for detecting ionizing radiation due to their ability to operate at room temperature, their small size and durability. Such detectors are used in a wide variety of applications, including medical diagnostic imaging, nuclear waste monitoring, industrial process monitoring, and space astronomy. Ionizing radiation includes both particulate radiation[[,]] such as alpha or beta particles[[,]] and electromagnetic radiation, such as gamma or ~~x rays~~ x-rays.

AT PAGE 2:

IN LINE 8 BEGINNING WITH THE WORDS "Room temperature detectors ..." AND ENDING WITH THE WORDS "...or "hole trapping."" PLEASE AMEND THE SPECIFICATION WITH THE REPLACEMENT PARAGRAPH AS FOLLOWS:

Room temperature detectors, however, suffer from a serious drawback. Because of limitation in the transport properties of the bulk semiconductor crystal, some of the electrons and, more particularly, some holes are generally lost by being trapped as they move toward the respective electrodes under the influence of the external electrical field. This is particularly evident for semiconductors wherein the transport properties of one carrier type (e.g., electrons) are much better than those of another type (in this example the "holes"). ~~Under such circumstance, therefore~~ Therefore, under such circumstances the amplitude of the output charge signal becomes dependent on the position within the crystal at which the ionizing radiation is absorbed. Generally speaking, the amplitude is less than the charge deposited by the ionizing radiation and results in a corresponding reduction of energy measurement accuracy, poor resolution, and reduced peak efficiency. This loss (or trapping) of charge in a radiation detector results in distorted and asymmetrical spectral peak shapes known as "hole tailing" or "hole trapping."

IN LINE 22 BEGINNING WITH THE WORDS "The inability to eliminate ..." AND ENDING WITH THE WORDS "...semi-conductor materials" PLEASE AMEND THE SPECIFICATION WITH THE REPLACEMENT PARAGRAPH AS FOLLOWS:

The inability to eliminate "hole" drift current is a major impediment for the use of room temperature semiconductors as detectors. Gamma-ray spectroscopy is particularly encumbered because pulse height spectra produced by these devices are distorted by this process. Mono-energetic gamma rays produce charge signal responses of different pulse height because the total combined distance drifted by the electrons and holes is dependent on the position of gamma-ray interaction. This phenomenon is well known in the prior art and has been described by many researchers. It is widely understood to be the major deficiency limiting the effectiveness of room temperature ~~semi-conductor~~ semiconductor materials.

AT PAGE 3:

IN LINE 3 BEGINNING WITH THE WORDS "Room temperature detectors ..." AND ENDING WITH THE WORDS "...or "hole trapping."" PLEASE AMEND THE SPECIFICATION WITH THE REPLACEMENT PARAGRAPH AS FOLLOWS:

Due to the deleterious effects of hole-trapping in semiconductor detectors, much effort has gone into attempting to solve this problem. U.S. Pat. Nos. 4,253,023 and 4,996,432 recognized the problem and proposed early remedies. The first of these included a method to de-convolute the contribution of the electron motion from the acquired signal. The second approach proposes a method relying upon use of a thick crystal and a crystal orientation placing the detector anode surface facing the source of ~~radiation~~ radiation, thereby reducing the positional dependence of the radiation interaction with the crystal and restricting it only to that part of the crystal immediately behind the anode. Neither of these approaches directly addresses the problem of eliminating hole-trapping.

AT PAGE 7:

IN LINE 20 BEGINNING WITH THE WORDS "Materials used for both ..." AND ENDING WITH THE WORDS "...substrate to optimize adhesion" PLEASE AMEND THE SPECIFICATION WITH THE REPLACEMENT PARAGRAPH AS FOLLOWS:

Materials used for both electrode and sublimation mask metal layers[[.]] include palladium, gold, carbon, indium-tin-oxide, chromium, tantalum and platinum. The films are deposited using techniques such as sputtering and electron beam deposition. Although sputtering will generally not cause substrate heating above 50-100°C for plasma powers less than 200 W, it was necessary to cool the substrate to optimize adhesion.

AT PAGE 14:

IN LINE 17 BEGINNING WITH THE WORDS "The lithography is an improvement ..." AND ENDING WITH THE WORDS "...shaped radiation sources." PLEASE AMEND THE SPECIFICATION WITH THE REPLACEMENT PARAGRAPH AS FOLLOWS:

The lithography is an improvement because (as an optical method) much finer feature ~~size~~ sizes can be obtained than with commonly used shadow mask techniques, allowing for enhanced ability to localize gamma-ray interactions, engineer the internal electric field in the devices, and generate higher quality images of shaped radiation sources.

IN LINE 22 BEGINNING WITH THE WORDS "The sublimation adds additional design ..." AND ENDING WITH THE WORDS "...imaging capability and energy resolution." PLEASE AMEND THE SPECIFICATION WITH THE REPLACEMENT PARAGRAPH AS FOLLOWS:

The sublimation adds additional design freedom and ~~consequently~~ consequently, performance. Currently there are no commercial methods for generating fine-line cross-strip imaging arrays, fine-line coplanar grids, ~~small pixels~~ small pixels having a small pitch, or etched trench detectors of HgI_2. Implementation of the new processing steps leads to x-ray and gamma-ray spectrometers with both improved spatial imaging capability and energy resolution.

AT PAGE 15:

IN LINE 1 BEGINNING WITH THE WORDS "Industrial suppliers will use ..." AND ENDING WITH THE WORDS "...and act as personal dosimeters." PLEASE AMEND THE SPECIFICATION WITH THE REPLACEMENT PARAGRAPH AS FOLLOWS:

Industrial suppliers will use this new process for fabricating HgI_2 x-ray and gamma-ray and charged-particle spectrometers for medical imaging, environmental monitoring, baggage handling, and materials sorting applications. The government will use HgI_2 detectors and instruments utilizing these sensors to detect nuclear smuggling, safeguard dismantled nuclear materials, search for nuclear weapons, verify treaty compliance, locate unexploded ordnance, detect contraband drugs, perform forensic analyses, conduct x-ray astronomy, ~~cleanup~~ clean up

waste sites, and act as personal dosimeters.

IN LINE 9 BEGINNING WITH THE WORDS "The primary cost of HgI_2 ..." AND ENDING WITH THE WORDS "...total production cost." PLEASE AMEND THE SPECIFICATION WITH THE REPLACEMENT PARAGRAPH AS FOLLOWS:

The primary cost of HgI_2 radiation detectors is in the crystal growth and ~~secondarily~~ secondarily, fabrication. Standard lithography equipment, evacuated furnaces, and sputtering equipment are required for the current process. It is estimated that these additional fabrication systems would represent less than 20% of total production cost.